

Appl. No. 09/746,462

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (cancelled)

Claim 2 (currently amended): A transformer comprising:

a core comprising two marginal portions each having two ends, a central portion having two ends and located in spaced relation between the two marginal portions and connecting portions interconnecting both ends of the central portion with corresponding ends of the two marginal portions;

at least one first primary winding and at least one first secondary winding wound around one of the two marginal portions; and

at least one second primary winding and at least one second secondary winding wound around the other of the two marginal portions;

wherein the central portion is adapted to provide a shunt for components of the magnetic field produced by electric current in the windings; and

A transformer according to claim 1 wherein the at least one first primary winding comprises two first primary windings, the at least one first secondary winding comprises one first secondary winding, the at least one second primary winding comprises two second primary windings and the at least one second secondary winding comprises one second secondary winding.

Claim 3 (original): A transformer according to claim 2 wherein:

the turn ratio of either of the two first primary windings to the first secondary winding is 1:1; and

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the turn ratio of either of the two second primary windings to the second secondary winding is 1:1.

Claim 4 (original): A transformer according to claim 2 further comprising:

means for connecting the two first primary windings to TIP and RING leads of a combined plain old telephone services (POTS) and any type of digital subscriber loop (xDSL) services and to a capacitor whereby the two first primary windings and the capacitor form a high pass filter (HPF);

means for connecting the first secondary winding to an xDSL circuit;

means for connecting the two first primary windings to one side of a low pass filter (LPF);

means for connecting the two second primary windings to another side of the LPF; and

means for connecting the second secondary winding to a POTS circuit.

Claim 5 (currently amended): A transformer according to claim 1 ~~2~~ wherein the cross-sectional area of the central portion, in relation to the dimensions of the marginal and connecting portions, is specified to regulate the extent to which components of the magnetic field produced by electric currents in the windings are shunted through the central portion,

whereby the strength of the magnetic coupling between any one of the first primary and secondary windings and any one of the second primary and secondary windings is tuned by the extent to which the components of the magnetic field are shunted through the central portion.

Claim 6 (currently amended): A transformer according to claim 1 ~~2~~ wherein the core portions are rectangular parallelepipeds.

Claim 7 (original): A transformer according to claim 6 wherein:

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the approximate width, height and depth of the central portion is 12 mm, 12 mm and 6 mm, respectively;

the approximate width, height and depth of the marginal portions is 1.5 mm, 12 mm and 6 mm, respectively; and

the approximate width, height and depth of the connecting portions is 3 mm, 1.5 mm and 6 mm, respectively.

Claim 8 (original): A transformer according to claim 7 wherein the magnetic coupling between any one of the first windings and any one of the second windings is in the range 0.01 to 0.25.

Claim 9 (original): A transformer according to claim 7 wherein the magnetic coupling between any two first windings is in the range 0.9 to 0.9999 and the magnetic coupling between any two second windings is in the range 0.9 to 0.9999.

Claim 10 (currently amended): A transformer according to claim 1 further comprising a first air gap inserted across the one marginal portion between the first primary and secondary windings.

Claim 11 (original): A transformer according to claim 10 wherein the first air gap is approximately 0.1 mm in width.

Claim 12 (previously presented): A transformer according to claim 10 further comprising a second air gap inserted across the other marginal portion between the second primary and secondary windings.

Claim 13 (original): A transformer according to claim 12 wherein the second air gap is approximately 0.1 mm in width.

Claim 14 (previously presented): A transformer for combined POTS and xDSL service comprising:

a core comprising two marginal portions each having two ends, a central portion having two ends and located in spaced relation between the two marginal portions and

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connecting portions interconnecting both ends of the central portion with corresponding ends of the two marginal portions;

two first primary windings and at least one first secondary winding wound around one of the two core marginal portions;

two second primary windings and at least one second secondary winding wound around the other of the core marginal portions for connecting the two first primary windings to TIP and RING and to a capacitor whereby the two first primary windings and the capacitor form a high pass filter (HPF);

terminals for connecting the first secondary winding to any type of digital subscriber loop (xDSL) circuit;

terminals for connecting the two first primary windings to one side of a low pass filter (LPF);

terminals for connecting the two second primary windings to another side of the LPF; and

terminals for connecting the second secondary winding to a plain old telephone service (POTS) circuit;

wherein the central portion of the core serves as a shunt to ensure only a very weak magnetic coupling between any one of the first windings and any one of the second windings relative to the magnetic coupling between any two first windings or any two second windings.

Claim 15 (original): A transformer according to claim 14 wherein the magnetic coupling coefficient between any one of the first windings and any one of the second windings is in the range 0.01 to 0.25 and the magnetic coupling coefficient between any two first windings and between any two second windings is in the range 0.9 to 0.9999.

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Claim 16 (original): A transformer according to claim 14 further comprising a first air gap provided in the one marginal portion between the first primary windings and the first secondary winding and a second air gap provided in the other marginal portion between the second primary windings and the second secondary winding.

Claim 17 (original): A transformer according to claim 15 further comprising a first air gap provided in the one marginal portion between the first primary windings and the first secondary winding and a second air gap provided in the other marginal portion between the second primary windings and the second secondary winding.

Claim 18 (original): A transformer according to claim 14 wherein the core is rectangular in cross-section with two rectangular holes extending therethrough to define the central, marginal and connecting portions of the core as parallelepipeds.

Claim 19 (currently amended): A transformer comprising:

a core comprising two marginal portions each having two ends, a central portion formed of a single piece of material and having two ends and located in spaced relation between the two marginal portions and connecting portions interconnecting both ends of the central portion with corresponding ends of the two marginal portions;

at least one first primary winding and at least one first secondary winding wound around one of the two marginal portions; and

at least one second primary winding and at least one second secondary winding wound around the other of the two marginal portions, the at least one second primary winding and the at least one second secondary winding not being directly connected to respective ones of the at least one first primary winding and the at least one first secondary winding;

wherein the central portion is adapted to provide a shunt for components of the magnetic field produced by electric current in the windings.

Claim 20 (new): A transformer according to claim 19 wherein the at least one first primary winding comprises two first primary windings, the at least one first secondary winding comprises

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one first secondary winding, the at least one second primary winding comprises two second primary windings and the at least one second secondary winding comprises one second secondary winding.

Claim 21 (new): A transformer according to claim 20 wherein:

the turn ratio of either of the two first primary windings to the first secondary winding is 1:1; and

the turn ratio of either of the two second primary windings to the second secondary winding is 1:1.

Claim 22 (new): A transformer according to claim 20 further comprising:

means for connecting the two first primary windings to TIP and RING leads of a combined plain old telephone services (POTS) and any type of digital subscriber loop (xDSL) services and to a capacitor whereby the two first primary windings and the capacitor form a high pass filter (HPF);

means for connecting the first secondary winding to an xDSL circuit;

means for connecting the two first primary windings to one side of a low pass filter (LPF);

means for connecting the two second primary windings to another side of the LPF; and

means for connecting the second secondary winding to a POTS circuit.

Claim 23 (new): A transformer according to claim 19 wherein the cross-sectional area of the central portion, in relation to the dimensions of the marginal and connecting portions, is specified to regulate the extent to which components of the magnetic field produced by electric currents in the windings are shunted through the central portion,

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whereby the strength of the magnetic coupling between any one of the first primary and secondary windings and any one of the second primary and secondary windings is tuned by the extent to which the components of the magnetic field are shunted through the central portion.

Claim 24 (new): A transformer according to claim 19 further comprising a first air gap inserted across the one marginal portion between the first primary and secondary windings.

Claim 25 (new): A transformer according to claim 24 further comprising a second air gap inserted across the other marginal portion between the second primary and secondary windings.

Claim 26 (new): A transformer comprising:

a core comprising two marginal portions each having two ends, a central portion having two ends and located in spaced relation between the two marginal portions and connecting portions interconnecting both ends of the central portion with corresponding ends of the two marginal portions;

at least one first primary winding and at least one first secondary winding wound around one of the two marginal portions; and

at least one second primary winding and at least one second secondary winding wound around the other of the two marginal portions, the at least one second primary winding and the at least one second secondary winding not being directly connected to respective ones of the at least one first primary winding and the at least one first secondary winding;

wherein the central portion is adapted to provide a shunt for components of the magnetic field produced by electric current in the windings; and

wherein the at least one first primary winding comprises two first primary windings, the at least one first secondary winding comprises one first secondary winding, the at least one second primary winding comprises two second primary windings and the at least one second secondary winding comprises one second secondary winding.

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Claim 27 (new): A transformer according to claim 26 wherein:

the turn ratio of either of the two first primary windings to the first secondary winding is 1:1; and

the turn ratio of either of the two second primary windings to the second secondary winding is 1:1.

Claim 28 (new): A transformer according to claim 26 further comprising:

means for connecting the two first primary windings to TIP and RING leads of a combined plain old telephone services (POTS) and any type of digital subscriber loop (xDSL) services and to a capacitor whereby the two first primary windings and the capacitor form a high pass filter (HPF);

means for connecting the first secondary winding to an xDSL circuit;

means for connecting the two first primary windings to one side of a low pass filter (LPF);

means for connecting the two second primary windings to another side of the LPF; and

means for connecting the second secondary winding to a POTS circuit.

Claim 29 (new): A transformer according to claim 26 wherein the cross-sectional area of the central portion, in relation to the dimensions of the marginal and connecting portions, is specified to regulate the extent to which components of the magnetic field produced by electric currents in the windings are shunted through the central portion,

whereby the strength of the magnetic coupling between any one of the first primary and secondary windings and any one of the second primary and secondary windings is tuned by the extent to which the components of the magnetic field are shunted through the central portion.

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Claim 30 (new): A transformer according to claim 26 further comprising a first air gap inserted across the one marginal portion between the first primary and secondary windings.

Claim 31 (new): A transformer according to claim 30 further comprising a second air gap inserted across the other marginal portion between the second primary and secondary windings.